

REMARKS

This amendment is in response to a second non-final Office action (Paper No. 7) mailed December 23, 2002. Upon entry of this amendment, claims 1-28 are pending in this application.

In paragraphs 1 and 2 of Paper No. 7, the Examiner complained that the electrodes in the embodiment where the heater is disposed on the underside of the nozzle plate is new matter. Applicants have deleted this feature from FIG. 4 and the specification making this new matter objection moot.

In paragraph 7 of Paper No. 7, the Examiner disagreed with Applicants' assertion that FIG. 1 is not prior art by referring to FIG. 9 of a Keefe *et al.* reference assigned to Hewlett Packard. No patent number or publication was given by the Examiner regarding this Keefe reference. In addition, Applicants have searched the file history and do not find evidence of a Keefe reference cited on a PTO 892 or PTO 1449 form. Therefore, Applicants request that the Examiner cite a patent number or other indicia so that Applicants can find this Keefe reference and only then determine whether or not FIG. 1 deserves the label "Prior Art".

The Examiner has rejected claims 1, 2, 4-9, 11-16, 18-20, 22, 24, 26, 27 and 28 under 35 U.S.C. 103 (a) as being unpatentable over Silverbrook, U.S. Patent No. 5,841,452 in view of JP 04250046 to Saikawa. Applicants traverse this rejection.

In Paper No. 7, the Examiner relies on FIGS. 17 and 18 of Silverbrook '452 for a teaching for a teaching of the funnel, ink passage, chamber, nozzle plate and heater structure. The Examiner relies on Saikawa '046 for a teaching of the grooves in the ink inlet passage. The Examiner then asserts that one having ordinary skill in the art would be motivated to modify Silverbrook '452 with Saikawa '046 to arrive at Applicants' claimed invention. Applicants disagree.

In Paper No. 7, it is noted that the Examiner relied only on a short English abstract of Saikawa '046 to reject Applicants' claims. Therefore, Applicants have translated the entire Saikawa '046 reference and are submitting a copy of the English translation of Saikawa '046 along with this amendment to the Patent Office.

Purpose of Saikawa '046 is totally unrelated to that of Applicants' invention and vice versa

Both the translated and the original versions of Saikawa '046 indicate that supply path 15, 21 are essentially circular in cross-section but also have grooves or indentations 31 to allow ink to flow if a circular bubble blocks the entrance (see paragraphs 53-62, claims 1-3 and FIGS. 1 and 7-9 of Saikawa '046). In other words, the purpose of the grooves 31 in the supply path 15, 21 in Saikawa '046 is not to cause the ink to flow faster through the supply path 15, 21 by increasing the area of the surface of the sidewalls of supply path 15, 21 as in Applicants' invention. Instead, the purpose of the grooves 31 in supply path 15, 21 of Saikawa '046 is instead to enable ink to flow when a

round bubble blocks the circular portion of the supply path 15, 21 so that ink can still flow through the grooved portion 31 of the supply path 15, 21. Meanwhile, in Applicants' invention is to have grooves in the ink inlet passage 120 to increase the surface area of the ink inlet passage to enable ink to flow more rapidly through the ink inlet passage 120 to replenish the chamber 130. Applicants' invention is not concerned with the presence of bubbles in the ink inlet passage 120 as is Saikawa '046.

Because the design of Saikawa '046 pertains to enabling ink to flow to the discharge port when a bubble is stuck in the supply path 15, 21 and Applicants' invention pertains to a structure that enables ink to flow more quickly through the ink inlet passage 120 irregardless of whether or not there is a bubble in the ink inlet passage 120, Applicants' submit that the purpose of Saikawa '046 is totally unrelated to that of Applicants' invention.

In addition, Applicants' submit that Applicants' invention does not fall within the scope and parameters of Saikawa '046:

In order to achieve this, Saikawa '046 defines certain variables and the relationship between these variables that must be adhered to in order for the ink jet structure in Saikawa to function properly despite the formation of bubbles. In the design of supply path 15, 21, Saikawa '046 defines "A" as the cross-sectional area of the circular portion of ink supply path 15, 21 excluding the cross section of the grooves or indentations 31. Saikawa '046 defines "S" as the entire cross sectional area

of the ink supply path 15, 21 including both the circular portion and the cross sectional area of the groove or indented portions 31. Saikawa '046 also defines "B" as the cross-sectional area of liquid flow path 12 used to connect supply path 15, 21 with ink discharge port 11. In order for the invention of Saikawa '046 to work, three inequalities must be met. They are 1) $A \leq 0.8 S$, 2) $(S-A) \geq B$ and 3) $0.4 S \leq A \leq 0.8 S$.

Of these three inequalities, Applicants submit that the second inequality is problematic. As illustrated in FIG. 1 of Saikawa '046, the liquid flow path 12 is very small compared to the supply path 15, 21. Because "B" is small in Saikawa '046 compared to "A" or "S", inequality 2 is easily satisfied in Saikawa '046 as demonstrated by paragraph 61 of Saikawa '046.

However, in Applicants' invention, there is no liquid flow path like liquid flow path 12 in Saikawa '046 where the cross sectional area between the ink inlet passage 120 and the orifice 111 is restricted. Therefore, if Applicants' invention was to satisfy inequality (2) of Saikawa '046, the grooves in the ink inlet passage 120 would have to be very huge. Applicants have examined FIG. 3 of Applicants' specification and determined that $S = 1.5 A$. In order for inequality (2) of Saikawa '046 to be satisfied, B would have to be less than $0.5 A$. However, Applicants' invention and figures do not show a constrained passage between ink inlet passage 120 and the orifice 111 where the cross sectional area is less than $\frac{1}{2} A$ where A is the cross sectional area of the circular portion of ink inlet passage 120. In fact, Applicants' FIG. 3 illustrates orifice or nozzle hole 111 to have a greater cross section than the cross section of ink inlet passage 120.

Therefore, Applicants' submit that if the structure of FIG. 17 or FIG. 18 of Silverbrook '452 were to be modified according to Saikawa '046, Applicants' claimed structure would not result. This is because Saikawa '046 teaches that inequality (2) must be satisfied. In order for inequality (2) to be satisfied, there needs to be a constrained flow path between the ink inlet passage 120 and the orifice 111. Applicants' invention does not have such a constrained path. In order for inequality (2) of Saikawa '046 to be satisfied in Applicants' structure, the grooves in ink inlet passage in Applicants' invention would have to be enormous. Since FIG. 3 of Applicants' invention does not show that these grooves are enormous, and because Applicants' invention does not have a constrained path between the ink inlet passage 120 and the orifice 111, one would not arrive at Applicants' invention if Silverbrook '452 were modified according to Saikawa '046.

This result should not be surprising as the grooves in Saikawa '046 are used to solve a problem totally unrelated to the problem Applicants' seek to solve. Applicants seek to improve ink flow and thus printing speed by increasing the surface area of the walls of the ink inlet passage 120 by using grooves while Saikawa '046 seeks to prevent bubbles from clogging passage 15, 21 by forming indentations or grooves in the sidewall of circular passage 15, 21. Saikawa '046 recognizes that air bubbles or gas bubbles are generally round due to surface tension. If there were no grooves in the walls of passage 15, 21, the round bubbles would completely block ink flow in a round passage. Therefore, Saikawa '046 puts grooves 31 in the sidewalls of passage 15, 21 so that if a round bubble is formed, ink can still flow through the grooved portion 31 of the passage 15, 21 while the bubble blocks the circular portion. Therefore, the purpose and construction of Saikawa '046 is

unrelated to Applicants' invention.

The reason that inequality (2) in Saikawa '046 must be satisfied in Saikawa '046 is that Saikawa '046 wants the constrained passage of liquid flow path 12 to be the rate limiting factor for speed and ink flow and not the smallness of the cross sectional area of the grooves to be the rate limiting factor. In Applicants' invention, there is no constrained passage between the ink inlet passage 120 and the orifice 111 because Applicants' ink jet print head is a totally different design than Saikawa '046. In Applicants' invention, it is the flow rate through the ink inlet passage 120 that is the rate limiting factor, not the flow rate at some point between the ink inlet passage 120 and orifice 111 as in Saikawa '046. Therefore, if Silverbrook '452 were to be modified according to the teachings of Saikawa '046, Applicants' claimed ink jet printhead would not result.

Rejections based on Chwalek '099

The Examiner has rejected claims 3, 10 and 17 under 35 U.S.C. 103 (a) as being unpatentable over Silverbrook, U.S. Patent No. 5,841,452 in view of JP 04250046 to Saikawa and further in view of Chwalek *et al.*, U.S. Patent No. 6,022,099. Applicants traverse this rejection.

Chwalek '099 pertains to an ink printer. A heater 50 is disposed on the nozzle rim 54 to heat ink near the nozzle rim to separate ink in an expanded meniscus to form an ink droplet. The meniscus expands not by heat but by pressure in the ink.

Unlike Applicants' claims, the heater in Chwalek '099 does not heat ink in a chamber. In fact, Chwalek '099 does not have an ink chamber. Chwalek '099 expands a meniscus as per FIGS. 3a-3e of Chwalek '099 to sever a droplet from the expanded meniscus. In Applicants' claims, the heater heats ink in the chamber to eject an ink droplet. Because Chwalek '099 does not do this, the rejection to claims 3, 10 and 17 must not stand.

A Letter to the Office Draftsman accompanies this Amendment for changes to FIG. 4. Indication in subsequent Office correspondence as to the acceptance of the drawing corrections proposed in the Letter is respectfully requested to enable Applicants to timely arrange for the corrections to be made prior to the date for payment of any issue fee.

No fees are incurred by the filing of this amendment.

In view of the above, all claims are deemed to be allowable and this application is believed to be in condition to be passed to issue. Should any questions remain unresolved, the Examiner is requested to telephone Applicant's attorney.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Please enter the following amendment(s):

1. Please amend the paragraph installed between paragraphs 0015 and 0016 on November 22, 2002 as follows:

FIG. 4 illustrates a sectional view of the ink jet printhead according to another embodiment of the present invention where the heaters 140' [and the electrodes 141'] are on the underside of nozzle plate 110. In this embodiment, the heaters 140' can directly heat ink in chamber 130 to produce bubbles to eject ink through orifice 111.

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